

Designing Effective Learning Experiences for Teachers

NCSM

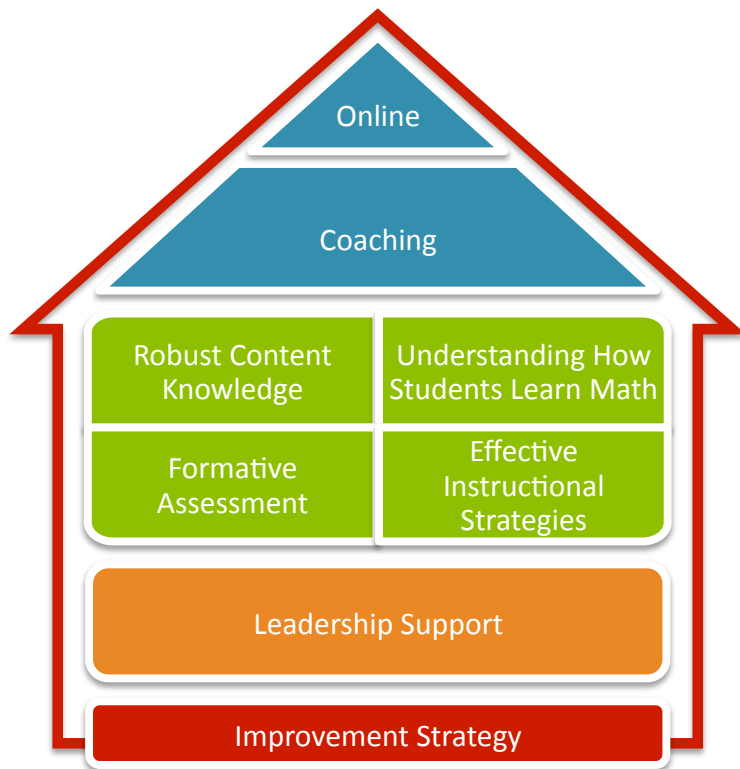
Denver 2013

Patty Clark and Marji Freeman

“Quality teachers have a greater influence on pupil achievement than any other school-based factor. How the nation educates teachers will largely determine the degree to which the United States can participate and succeed in the emerging knowledge economy.”

Daniel Fallon, Program Director
Carnegie Corporation of New York, Higher Education

A Blueprint for Instructional Excellence



Effective Professional Learning...



...is part of a larger, long-range strategy to improve math instruction and student outcomes



...is built on a foundation of leadership support



...addresses the instructional needs of every teacher



...is sustained through differentiated, targeted, on-going professional learning

Guiding Principles



Robust Content
Knowledge

Understanding of
How Students
Learn



Instructional
Needs



Insight into
Individual
Learners through
Formative
Assessment

Effective
Instructional
Strategies





Robust Content Knowledge

Robust Content Knowledge

Which student is using a method that would work for any two whole numbers?

Student A	Student B	Student C
$\begin{array}{r} 35 \\ \times 25 \\ \hline 125 \\ +75 \\ \hline 875 \end{array}$	$\begin{array}{r} 35 \\ \times 25 \\ \hline 175 \\ +700 \\ \hline 875 \end{array}$	$\begin{array}{r} 35 \\ \times 25 \\ \hline 25 \\ 150 \\ 100 \\ +600 \\ \hline 875 \end{array}$

Number and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.

4.NBT.5 –Multiply a whole number of up to four digits by a one-digit number, and multiply two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Robust Content Knowledge

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Understanding How Students Learn



How Students Learn

- Think of a time when you learned something.
- What conditions were present that gave you access to learning?

Conditions for Learning

- A need to know
- Time to learn
- Hands on experience
- Permission to make mistakes and learn from them
- A supportive teacher/supportive environment

For Learning to Occur

- Physical Experience
- Social Interaction
- Maturity

Two Aspects of Learning Mathematics

Making Sense

The source of learning
is internal.

Learning Social Conventions

The source of learning
is external.

James Bullock defines mathematics as a form of language invented by humans to discuss abstract concepts of numbers and space. He states that the power of the language is that it enables scientists to construct metaphors which scientists call "models". Mathematical models enable us to think critically about physical phenomena and explore in depth their underlying ideas. Our traditional form of mathematics education is really training, not education and has deprived our students of becoming truly literate.

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Insight Into Individual Learners Through Formative Assessment

Assessing Through Questioning

- What do you know about this problem?
- What is the relationship of this to that?
- Could you explain what you think you know right now?
- Can you predict what will happen?
- Is the solution reasonable, considering the context?
- Is there a real-life situation where this could be used?

Math Reasoning Inventory

$$12.6 \times 10$$

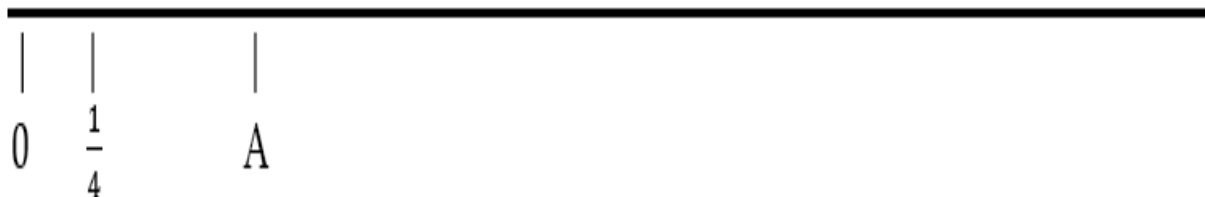
Effective Instructional Strategies



Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Which is a better choice, $\frac{3}{5}$ or $\frac{7}{8}$ for the location A on the number line?



During the Video

- What is the role of the teacher in this discussion?
What skills has this teacher developed?
- What is the role of the students in this discussion?
What skills have the students developed?

Reflect on the Video

- What is the role of the teacher in this discussion?
What skills has this teacher developed?
- What is the role of the students in this discussion?
What skills have the students developed?

Effective Instructional Strategies

- Choosing and using rigorous tasks with fidelity
- Engaging all students in productive discourse
- Asking quality questions instead of giving answers
- Establishing a classroom culture that supports reasoning, sense-making, and constructive struggle

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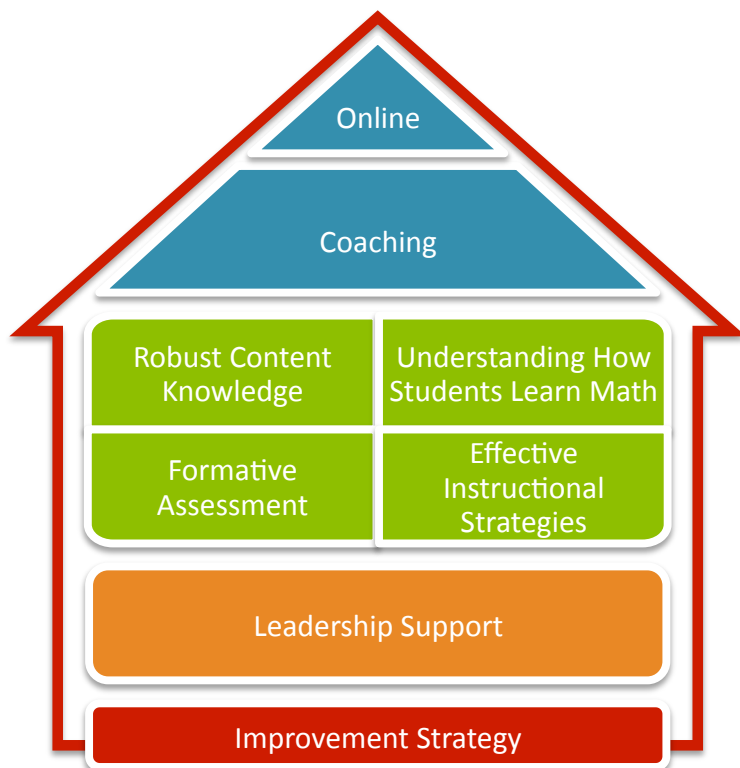
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The National Staff Development Council found that efforts to improve student achievement can succeed only by building the capacity of teachers to improve their instructional practice and the capacity of school systems to promote teacher learning.

(Chung Wei, Darling-Hammond, et al. 2009).

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